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C. cancroides, attached to the House-fly. The *Chelifer* of the Elater is different from either of those just named, and is perhaps an undescribed species. Its characters are as follows:—

Chelifer alius.—Body in general chestnut-brown; the pedipalps and the dorsal shield of the cephalothorax being darkest; the abdomen lightest, and in the largest individuals, probably females, whitish with transverse dorsal and ventral bands of brown. Body with the sides nearly parallel, but widening slightly posteriorly; being widest near the termination of the abdomen, except in the largest female, in which it is widest near the middle of the abdomen. Maxillary palps shorter, or not longer than the body; intermediate joints of the same about twice the length of their thickness. Length of body from $1\frac{1}{2}$ to $2\frac{1}{2}$ mm.; length of pedipalps from $1\frac{1}{2}$ to $1\frac{9}{10}$ mm. All parts are hairy, but the abdomen of the largest ones is less so than in the others.

The species bears much resemblance in form and color to the *C. Reussii*, Koch. It also resembles the *C. americanus*, De Geer, but does not possess the knob on the penultimate joint of the pedipalp.

June 26.

The President, Dr. Ruschenberger, in the chair.

Nineteen members present.

The Birth of a Rhizopod.—Prof. Leidy remarked that while it was a matter of common observation that the naked Rhizopods, like *Amœba*, and *Actinophrys*, multiply by division, the manner in which the test-bearing forms were produced was not so obvious.

Many instances are recorded in which observers, beginning with Le Clerc, who first described a *Difflugia*, have noticed pairs of individuals attached by the mouths of their tests. In these instances the animals have generally been supposed to be in copulation, or conjugation as it is commonly called, and perhaps such is often the case. It has also been repeatedly noticed in many cases that of the two individuals in conjugation one was somewhat smaller and more delicate, and if it were a colored species, it was paler than the other. Little significance usually has been given to this difference.

Claparede and Lachman (Etudes sur les Infusoires, 1859, 445) have viewed such cases of the supposed conjugation of *Arcella*, as simply the formation of a new test to accommodate the contents of an old one which had become too small.

Bütschli (Archiv f. Mikr. Anat. 1875, 459), after observing the supposed conjugation of *Arcella*, noticed within the test free moving *Amœbæ*. These he supposed were the brood of the former, but after having seen them escape from the test, he failed to trace their further course.

Cienkowski recently (Archiv f. Mikr. Anat. 1876, 41) described the mode of multiplication of *Chlamydophrys stercorea*, in which he observed the animal to protrude from its test a mass of sarcode, which, assuming the size, form, and structure of the parent, became detached from it as an independent individual. He remarks that this procedure for Rhizopods is not new, and has been indicated by Cohn and others, in *Arcellæ*, as copulation.

Prof. Leidy continued: I have repeatedly observed different species of *Difflugia*, *Hyalosphenia*, *Nebela*, *Euglypha*, *Trinema*, *Cyphoderia*, *Arcella*, etc., in what has been supposed to be the condition of conjugation, and have often watched them carefully to learn the results of the process. I have noticed that one individual engaged in the process is often smaller and paler than the other, but frequently also the two were alike in all respects. Between the attached individuals I have observed a fusion of the contents, sometimes a rapid transference of the contents from one to the other test and back again, and at others a sort of circulation or flowing of the contents in a circle from one to the other test. After separation of the tests usually nothing further was observed. In one instance I saw two small Difflugians conjoined with the mouth of a larger, all of the same form; and in another instance I saw three small individuals of *Difflugia spiralis* in the same manner conjoined with one large one of the same species.

I have long sought for the mode of multiplication of the test-covered Rhizopods, but thus far with little success. It appears as if the different forms with which we meet are always mature, and rarely are individuals seen with the ordinary characters which distinguish young from adult animals.

Recently I observed a pair of conjoined individuals of *Euglypha alveolata*, which in their procedure appeared to coincide with the mode of multiplication of *Chlamydophrys stercorea*, as described by Cienkowski. One of the *Euglyphæ* was one-seventh of a millimetre long (0.14 mm. long.; 0.068 mm. in the short diameter), and had four long spines diverging from the fundus of the test. This was replete with the contents, including the usual large nucleus; and it presented no perceptible interval between the mass of sarcode and the interior surface of the test. The sarcode was mingled throughout with particles of food, and also included a large *Navicula*. The food was not collected in balls contained in vacuoles, but was diffused through the sarcode, from the mouth to the fundus of the test, imparting to it a brownish hue. The globular nucleus measured $\frac{1}{25}$th of a millimetre.

Closely adherent to the mouth of the larger or parent *Euglypha* was the smaller or younger one, little more than half the size of the parent (measuring 0.08 mm. long, and 0.06 mm. wide). The young *Euglypha* had the fundus somewhat abruptly narrowed and acute, and had projecting from it the same number of spines as in the parent test. The peculiar structure of the test was apparent, but appeared less extended or unfolded. The contents filled the test, and consisted of clear, colorless, finely granular protoplasm without any mixture of food and without a nucleus.

Such was the appearance of the conjoined *Euglyphæ*, parent and offspring, at the commencement of the observation, at 6¼ o'clock in the morning.

Closely watching the pair, the young *Euglypha* was noticed slowly to enlarge, and the brownish matter of the parent sarcode gently flowed into and became gradually diffused with the previously clear, colorless sarcode of the child. The fundus of the latter expanded and became obtusely rounded, like that of the parent. The large nucleus of this disappeared, or became so completely obscured as not to be visible. For some time there was no further very perceptible change within either test.

An hour from the commencement of the observation the young *Euglypha* had nearly acquired the size, shape, and appearance of the parent, and it measured 0.112 mm. long, and 0.064 mm. broad. Now commenced an active circulation, a cyclosis, of the contents of the two tests, resulting in a thorough admixture. The sarcode flowed continuously from the parent on one side through the mouths into the child and back again on the other side. Both tests were replete with one continuous mass of brown, granular sarcode, without nucleus or contractile vesicles, but with the *Navicula*, which remained within the parent. During the circulation of the sarcode, two of the spines, with the circular scale at their base, became detached from the young *Euglypha*. The circulation ceased. At 7½ o'clock I first observed the appearance of a contractile vesicle, 0.016 mm. in diameter, at the fundus of both animals. The vesicle collapsed and reappeared in two, three, or four, each again successively collapsing. With the appearance of the contractile vesicles the contiguous sarcode began to clear up, the brownish matter accumulating in advance of the usual position of the nucleus when present.

At this time the young *Euglypha* measured 0.116 mm. long, and 0.064 mm. broad.

The sarcode of the parent now contracted at the middle, leaving a space between it and the test. The same change occurred in the child. The sarcode of the parent next cleared up in the vicinity of the mouth, then separated from that of the offspring, and retracted a short distance within the mouth.

At 5 minutes to 8 o'clock the two *Euglyphæ* bent slightly from side to side, protruded delicate pseudopods, and in two minutes afterwards were completely separated with their mouths directed downward, and their fundi turned towards my eye.

Half an hour after separation, a pale nucleus had made its appearance in both individuals occupying the usual position, and measuring 0.028 mm. in diameter. Two or more contractile vesicles disappeared and reappeared around the position of the nucleus. While the parent retained the original size, the young *Euglypha* was 0.12 mm. long, by 0.064 mm. broad.

From this observation of the mode of multiplication of *Euglypha*, coupled with that of Cienkowski on the multiplication of *Chlamydophrys*, it may be inferred that all the test-bearing Rhizopods multiply in a similar manner.

The well-fed and replete Rhizopod rapidly protrudes from its test half its sarcode, which assumes the form and constitution of the parent and then separates from it. It is the division of the sarcode mass, as in an *Amœba*, with the development of a new test upon the extruded portion. In forms like *Hyalosphenia*, *Euglypha*, and *Arcella*, the peculiar test is a production from the ectosarc. Without having observed the process, I suspect that the species of *Difflugia* in the act of multiplication protrude their offspring mass of sarcode among particles of sand, which at once adhere and build up the strong wall of their test.

The mode of multiplication of the test-covered Rhizopods reminds one of the mode of production by division of the Desmids, and, in observing the process of production of the *Euglypha*, I was forcibly struck with its resemblance to the mode of production of *Arthrodesmus octocornis*. The production of the young Rhizopod would correspond with the production of a half cell of a Desmid.

The mode of production of Rizopods, as indicated, suggests the probable mode of multiplication of the chambers of the Foraminifera. Masses of sarcode, successively larger and larger, may from time to time be quickly protruded to form the successively larger and larger chambers. The walls of the chambers of the calcareous forms may be developed like the chitinous wall of an *Arcella* upon the protruded mass of sarcode, and the particles of sand of the arenaceous forms may become adherent in the same manner as is suspected to be the case in *Difflugia*.

In this connection it has occurred to me that just as the sarcode mass of a Rhizopod, previous to division, will apparently suddenly grow or expand to nearly double the size, perhaps also in this mode in many tissues of the higher animals we may have a similar procedure in the reproduction of cells. Perhaps in this way the deep cells of the epidermis may give rise to the next series above, or the old ones may be displaced by extension of the protoplasmic mass below.

After observing the birth of a *Euglypha*, I collected material rich in Rhizopods, and spent much time in searching for others in the act of reproduction.

In some water squeezed from sphagnum collected near Swarthmore College, there were abundance of the Difflugian, which I have named *Nebela flabellulum*, with fewer individuals of *Nebela numata*. They were all replete with food, and in most cases the tests so well occupied by the sarcode as to leave no perceptible interval. Incidentally it may be observed that when a Difflugian discharges all its food or the remains of it and is some time deprived of sustenance, the sarcode mass becomes reduced so as to occupy but a small portion of the space within the test to which it is then attached by long threads of the ectosarc. Having observed an individual of *Nebela numata* with a small bulbous mass of sarcode projecting from the mouth, I watched it closely. In the course of one hour and three-quarters the protruded sarcode had gradually enlarged and assumed the form and nearly the size of the test. Half an hour later the sarcodic mass suddenly burst, leaving detached from the *Nebela* test two large and clear globules of protoplasm, and separately the mass of granular matter, remains of the food, that had occupied the entosarc. Later, the two globules of protoplasm appeared shrivelled, and the *Nebela* test contained only some dirt, part of the remains of the food which had occupied the entosarc.

Later, I saw the same process nearly repeated with a *Nebela flabellulum*. This measured a tenth of a millimetre broad, with a fraction less in length, and when first noticed had a mass of protruding protoplasm about one-thirtieth of a millimetre in diameter. Three hours subsequently the latter had separated from the mouth of the test, and had acquired nearly the size and form of the *Nebela*. In this condition it remained another hour, and shortly afterwards appeared shrivelled and dead. The *Nebela* test appeared to be empty of sarcode and contained only dirt, apparently the remains of the food which had occupied the entosarc.

Hertwig and Lesser (Archiv f. Mikr. Anat. 1874, Pl. III., figs. 8 B. C.) represent the same condition in *Lecythium hyalinum* as the result of dissolution.

Bütschli mentions a nearly similar occurrence with an *Arcella*. He says that after the conjugation of a pair, he observed one of the animals with a large portion of the protoplasm protruded. Later, this lay near the *Arcella* as a clear circular plate of the same size, but without mouth or structure. The protoplasm had withdrawn into the test, and, later, both appeared decomposed.

These last cases may have been abortive attempts at reproduction, ending in dissolution.

During the recent observations to detect the mode of multiplication of Rhizopods, I found an *Arcella vulgaris* which contained between the central sarcodic mass and the test four oval bodies. These, at first glance, I thought were young *Arcellæ*, but discovered that they were eggs, and, watching them for several days, they were seen to develop Rotifers. They were prevented from escaping from the test by the sarcode mass of the *Arcella*, and finally all died together.

On the Velocity of Infinite Fall.—Prof. PLINY E. CHASE remarked that in his studies of the influence of planetary centres